

What Is Claimed Is:

1 1. A nucleic acid detection device, comprising:
2 a solid support having at least one unique addressable area;
3 at least one probe set, each comprising multiple types of
4 oligonucleotides, each type of oligonucleotide having a
5 determinable sequence, wherein the oligonucleotides are
6 immobilized on at least one surface of the solid support, each
7 probe set being localized in one of the addressable areas.

1 2. The device as set forth in claim 1, wherein each probe set
2 comprises 2 to 10 types of oligonucleotides having different
3 sequences.

1 3. The device as set forth in claim 2, wherein each probe set
2 comprises 2 to 4 types of oligonucleotides having different
3 sequences.

1 4. The device as set forth in claim 1, wherein each
2 oligonucleotide in each probe set is specific to a different
3 target sequence.

1 5. The device as set forth in claim 1, wherein the length of
2 each oligonucleotide is 4 to 400 bases.

1 6. The device as set forth in claim 5, wherein the length of
2 each oligonucleotide is 8 to 80 bases.

1 7. The device as set forth in claim 1, wherein each addressable
2 area is smaller than 1 mm².

1 8. The device as set forth in claim 1, wherein each addressable
2 area is smaller than 0.1 mm^2 .

1 9. The device as set forth in claim 1, wherein each addressable
2 area is smaller than 0.01 mm^2 .

1 10. The device as set forth in claim 1, wherein each addressable
2 area is smaller than 0.0001 mm^2 .

1 11. The device as set forth in claim 1, wherein the density of
2 the probe set on the solid support is greater than 100 probe sets
3 per cm^2 .

1 12. The device as set forth in claim 1, wherein the density of
2 the probe set on the solid support is greater than 1,000 probe
3 sets per cm^2 .

1 13. The device as set forth in claim 1, wherein the density of
2 the probe set on the solid support is greater than 10,000 probe
3 sets per cm^2 .

1 14. The device as set forth in claim 1, wherein the solid support
2 is a plane surface, a curved surface, a tube, a fiber, a
3 microparticle, or a microbead.

1 15. The device as set forth in claim 1, wherein the solid support
2 is glass, polymer, plastic, metal, silicon, or inorganic
3 materials.

1 16. The device as set forth in claim 1, wherein the probe set
2 is immobilized on the surface of a gel material applied to the
3 solid support or inside a gel material applied to the solid
4 support.

1 17. The device as set forth in claim 1, wherein the solid support
2 has a porous structure.

1 18. The device as set forth in claim 1, wherein the device is
2 a microarray.

1 19. The device as set forth in claim 1, wherein the
2 oligonucleotides are nucleic acids capable of pairing with DNA.

1 20. The device as set forth in claim 1, wherein the
2 oligonucleotides are nucleic acids capable of pairing with RNA.

1 21. The device as set forth in claim 1, wherein the
2 oligonucleotides are DNAs.

1 22. The device as set forth in claim 1, wherein the
2 oligonucleotides are RNAs.

1 23. The device as set forth in claim 1, wherein the
2 oligonucleotides are PNAs.

1 24. The device as set forth in claim 1, wherein each type of the
2 oligonucleotide is synthesized and then immobilized on the solid
3 support.

1 25. The device as set forth in claim 24, wherein each type of
2 oligonucleotide is immobilized in sequence.

1 26. The device as set forth in claim 24, wherein each type of
2 oligonucleotide is immobilized simultaneously as a mixture.

1 27. The device as set forth in claim 1, wherein each type of
2 oligonucleotide is directly synthesized on the solid support.

1 28. The device as set forth in claim 1, wherein each probe set
2 contains substantially equal quantities of each type of the
3 oligonucleotide.

1 29. The device as set forth in claim 1, wherein the
2 oligonucleotides of a probe set are evenly distributed across
3 the unique addressable area.

1 30. The device as set forth in claim 1, wherein the quantity of
2 each type of oligonucleotides corresponds to its affinity to the
3 target sequence.

1 31. A nucleic acid detection device, comprising:
2 at least one type of distinguishable microparticle, each
3 distinguishable from other types of microparticles;
4 at least one probe set, each comprising multiple types of
5 oligonucleotides designed specifically to different target
6 sequences, each type of oligonucleotide having a determinable
7 sequence, wherein the oligonucleotides are immobilized on the
8 microparticles.

1 32. The device as set forth in claim 31, wherein each type of
2 microparticle carries identification distinguishing it from
3 other types of microparticles, the identification based on
4 particle size, fluorescence signal, radioactive signal, shape,
5 color, or composition of the particle.

1 33. The device as set forth in claim 31, wherein the particle
2 is glass, polymer, plastic, metal, silicon, or inorganic
3 materials.

1 34. The device as set forth in claim 31, wherein the probe sets
2 are immobilized on the surface of the microparticles.

1 35. The device as set forth in claim 31 wherein the
2 microparticles are porous, and the probe sets are immobilized
3 inside the microparticles.

1 36. The device as set forth in claim 31, wherein the probe sets
2 are immobilized on the surface or inside a gel material applied
3 to the microparticles.

1 37. The device as set forth in claim 31, wherein each probe set
2 comprises 2 to 10 types of oligonucleotides having different
3 sequences.

1 38. The device as set forth in claim 37, wherein each probe set
2 comprises 2 to 4 types of oligonucleotides having different
3 sequences.

1 39. The device as set forth in claim 31, wherein the length of

2 each oligonucleotide is 4 to 400 bases.

1 40. The device as set forth in claim 39, wherein the length of
2 each oligonucleotide is 8 to 80 bases.

1 41. A method for detecting nucleic acid, comprising the following
2 steps:

3 providing at least one probe set comprising multiple types
4 of oligonucleotides;

5 providing a solid support having at least one unique
6 addressable area;

7 attaching the probe set to the unique addressable area of
8 the solid support;

9 allowing sample nucleic acids to hybridize with probe sets;

10 labeling the sample nucleic acids with a detectable signal
11 before or after the hybridization; and

12 determining the results of the hybridization.

1 42. The method as set forth in claim 41, wherein the labeling
2 of the sample nucleic acids is achieved by performing a technique
3 fluorescence labeling, chemiluminescence labeling, electric
4 signal labeling, and radioactive labeling.

1 43. The method as set forth in claim 41, wherein each probe set
2 comprises 2 to 10 types of oligonucleotides having different
3 sequences, and each type of oligonucleotide specific to a
4 different target sequence.

1 44. The method as set forth in claim 43, wherein each probe set
2 comprises 2 to 4 types of oligonucleotides having different

3 sequences, and each type of oligonucleotide specific to a
4 different target sequence.

1 45. The method as set forth in claim 41, wherein the length of
2 each oligonucleotide is 4 to 400 bases.

1 46. The method as set forth in claim 45, wherein the length of
2 each oligonucleotide is 8 to 80 bases.

1 47. The method as set forth in claim 41, wherein the
2 oligonucleotides are nucleic acids capable of pairing with DNA.

3
4 48. The method as set forth in claim 41, wherein the
5 oligonucleotides are nucleic acids capable of pairing with RNA.

1 49. The method as set forth in claim 41, wherein the
2 oligonucleotides are DNAs.

1 50. The method as set forth in claim 41, wherein the
2 oligonucleotides are RNAs.

1 51. The method as set forth in claim 41, wherein the
2 oligonucleotides are PNAs.

1 52. The method as set forth in claim 41, wherein each probe set
2 contains substantially equal quantities of each type of the
3 oligonucleotides.

1 53. The method as set forth in claim 41, wherein the
2 oligonucleotides of a probe set are evenly distributed across

3 the unique addressable area.

1 54. The method as set forth in claim 41, wherein the quantity
2 of each type of the oligonucleotides corresponds to its affinity
3 to the target sequence.